

REVISION OF THE SPECIES OF MICROPHOTUS, with an emendation of the Lampyrini (Lampyridae)

By JOHN WAGENER GREEN¹

Microphotus is a small genus of inconspicuous Lampyrids occurring in the southwestern United States and adjacent parts of Mexico. Nine specific and subspecific names have been published by LeConte, Fall, and Ernest Olivier. A tenth name is added in the present analysis, and three corrections in the synonymy are announced, the male genitalia being used as the principal criterion for species segregation. In a supplementary discussion a new and precise definition of the tribe *Lampyrini* is proposed, with notes on the allocation of the American components of this and related tribes.

This investigation was made possible by the generous cooperation of the following institutions and individuals, to whom the author wishes to convey his sincere thanks and appreciation. The abbreviations in parentheses preceding the names are used in the text to indicate the present location of certain specimens.

- (ANSP) Academy of Natural Sciences of Philadelphia, James A. G. Rehn and H. J. Grant.
- (AMNH) American Museum of Natural History, Mont A. Cazier and J. C. Pallister.
- (CAS) California Academy of Sciences, E. S. Ross and H. B. Leech.
- (CM) Carnegie Museum, George Wallace.
Chicago Museum of Natural History, R. W. Wenzel and H. S. Dybas.
- (CU) Cornell University, Henry Dietrich.
- (INHS) Illinois Natural History Survey, M. W. Sanderson.
- (MCZ) Museum of Comparative Zoology, P. J. Darlington
Ohio State University, J. N. Knull.
Rockerfeller Foundation, Mexico City, W. W. Gibson.
University of Arizona, Floyd Werner.
University of California at Berkeley, P. D. Hurd.
University of California at Davis, A. T. McClay.
University of Kansas, G. W. Byers.
University of Michigan, T. E. Moore.
- (U. Minn) University of Minnesota, E. F. Cook.
- (USNM) U. S. National Museum, T. J. Spilman.
Owen Bryant.
J. M. Burns.
G. H. Nelson.
- (Parker) Frank Parker.
- (Rotger) Rev. Bernard Rotger, C. R.

MICROPHOTUS LeConte

Microphotus LeConte, 1866, Smiths. Misc. Coll., number 167, 6:89.

MALE. Form elongate, parallel-sided. Eyes very large, contiguous beneath or nearly so, separated above, head concave between them. Antennae approximate, shorter than pronotum, not compressed, with less than eleven segments, segment 1 short and stout, its apex strongly oblique, 2 nearly as stout and about as long as the short outer side of 1, its apex much wider than base of 3, 3 elongate and subtriangular, distal segments more or less subquadrate, terminal segment with minute tubercle-like appendix near edge of subtruncate apex. Clypeus connate with front, extending to tips of mandibles and largely concealing them from above, sparsely granulate punctate and with coarse setae directed anteriorly, apex narrowly rounded; membranous labrum small, usually deflexed and not visible from above. Mandibles stout, subporrect, feebly curved, coarsely pubescent; tips rounded externally, inner apical angle extended in a glabrous spine-like process directed obliquely inward and variable in length, sometimes reduced (by abrasion?) to a minute denticle. Maxillary palpi short and stout, last three segments forming a compact mass longer than wide and divided obliquely, terminal segment subtriangular, its tip glabrous. Labial palpi very small, with two distinct segments, the terminal longer than wide, somewhat compressed, subtriangular, inner side very short, outer side and apex subequal.

Pronotum feebly transverse, broadly rounded in front, lateral margins subparallel or converging basally, base truncate or feebly emarginate; disk strongly convex over eyes in a circular outline, anterior margin narrowly reflexed, sides broadly explanate; surface with sparse decumbent pubescence and shallow irregular punctation, granulate-punctate on narrower basal part of median convex area, this area also with minute secondary pubescence.

Elytra somewhat dehiscent, not extending to tip of abdomen, surface more or less rugose; primary pubescence not dense, regularly distributed, directed posteriorly, the setae arcuate with tips approaching elytral surface; minute secondary pubescence present, sometimes very sparse basally; epipleurae narrow, not attaining apex.

Ventral surface, except prothorax, sparsely granulate-punctate. Prosternum very short before coxae, truncate in front or with feeble median emargination. Abdominal tergites not foliate, ventral segment 8 with apical process; spiracles located near base and slightly exterior to lateral margins of ventral segments 2 to 8, visible laterally unless abdomen is completely collapsed; light organs not apparent. Legs short, femora not extending beyond margin of body; tarsi slender, fourth segment small, subequal in length to third, not bilobed, terminal segment long, extending for most of its length beyond apex of fourth; claws simple.

FEMALE. Larviform, without wings or elytra. Head small, elongate, eyes vestigial; antennae similar to male, with fewer segments. Prosternum long before coxae, head completely retractile. Abdomen with eight segments, ventral segment 1 fully visible and subequal to second; light organs not apparent.

All the species of *Microphotus* are quite similar in coloration. The pronotum is pale flavate with the convex median area usually darker. The scutellum and adjacent areas are pale flavate. The elytra are some shade of brown, varying from quite pale to rather dark. In *M. dilatatus* the elytra and the convex area of the pronotum are normally dark brownish piceous, and paler individuals are exceptional. The other species are

usually of a more dilute color, although dark examples may occur. In several species the elytra are more or less infusate at tip. The ventral surface is pale fulvous, varying with the metasternum and median areas of the ventral segments brownish. The legs are uniformly pale.

The pygidium and preceding tergite usually have the hind angles somewhat produced posteriorly. These sclerites are, however, subject to variability and of little value in the definition of species. All measurements of length in the descriptions that follow are from the anterior margin of the pronotum to the elytral apices.

A number of elongate African species are very close to *Microphotus* having similar appendiculate antennae with less than eleven segments, but differing by the absence of the apical process of ventral segment 8, and in having the abdominal spiracles truly ventral. Examples of these sent to Dr. Basilewsky, of the Congo Museum, were said by him to approach closely to certain species placed in *Lampyris*, notably *L. tinantae* Pic, *L. acuminata* Pic, and *L. mozambica* Kolbe. It is noted that in most of these African species the protarsi are short and somewhat dilated, with segments 1 to 3 each strongly transverse, and the claws and terminal segment of all tarsi perceptibly enlarged. An exception to this is a small species from Southern Rhodesia (U. Minn., 2 examples) having normally slender and elongate tarsi.

Key to males of *Microphotus*

1. Elytra less than three times as long as pronotum, averaging about two and one-half times 2
 Elytra more than three times as long as pronotum 3
2. Antennae with eight or nine segments. Pronotum posteriorly most prominent at hind angles, base shallowly emarginate throughout its width. Size larger, elytra uniformly dark brown **Microphotus dilatatus** LeConte
 Antennae with eight segments. Pronotum truncate at base. Size smaller, elytra pale brown with darker tips..... **Microphotus octarthrus** Fall
3. Antennae with more than eight segments 4
 Antennae with eight segments. Median longitudinal line of pronotum not impressed 6
4. Antennae with nine or ten segments. Median longitudinal line of pronotum not impressed. Aedeagus as in figure 3 **Microphotus angustus** LeConte
 Antennae with ten segments. Median longitudinal line of pronotum strongly impressed. Aedeagus as in figure 4 5
5. Eyes smaller, briefly contiguous beneath posteriorly. Pronotum with circular convex area over eyes usually extending not more than half way from apex toward base **Microphotus decarthrus** Fall
 Eyes larger, broadly contiguous beneath posteriorly. Pronotum with circular convex area over eyes extending from apex more than half way to base **Microphotus fragilis** E. Oliver

6. Aedeagus as in figure 5. Scutellum usually narrowly rounded at apex
 *Microphotus pecosensis* Fall
 Aedeagus as in figure 6. Scutellum usually with apical notch
 *Microphotus chiricahuae* Green, new species

Microphotus dilatatus LeConte

Microphotus dilatatus LeConte, 1866, Smiths. Misc. Coll., number 167, 6:90.

Microphotus rinconis Fall, 1912, Canadian Ent., 44:44 (new synonymy).

MALE. Form broader than usual. Antennae with eight or nine segments. Eyes beneath broadly contiguous posteriorly. Pronotum relatively larger than in any other species, about one-fourth wider than long, lateral margins subparallel, base arcuately emarginate throughout, emargination about one-tenth as deep as wide, rarely lacking; median longitudinal line not impressed, convex area usually rather dark piceous brown. Elytra usually dark piceous brown, about two and one-half times as long as pronotum, sides rather widely explanate, lateral margins broadly arcuate; secondary pubescence distinct except near base, gradually longer and denser distally. Genitalia as in figure 1. Length 5-8 mm.

DISTRIBUTION. ARIZONA: Agua Caliente; Baboquivari Mts.; Badger; Benson; Ft. Grant; Gila Bend Mts.; Gila County; Globe; Nogales; Patagonia; Rincon Mts.; Sabino Canyon, S. Catalina Mts.; Santa Rita Mts.; Santa Cruz Village, Cobabi Mts.; Sierritas; Superior; Tanque Verde; Tucson; Tucson Mts.; Wickenburg. July and August. SONORA: Minas Nuevas, Alamos; Guaymas. July and August. BAJA CALIFORNIA: Triunfo; San Bartolo; El Taste. July.

This is our most abundant species, and also the one most easily recognized. It is distinguished from all other species except *M. octarthrus* by the short elytra; and it is the only known species in which the base of the pronotum is emarginate and posteriorly most prominent at the hind angles. There are no perceptible differences between Arizona specimens (*rinconis*) and those from Baja California. It is the type species of the genus, the type locality being Cape San Lucas, Baja California. Fall's type was taken in the Rincon Mountains, Arizona.

Microphotus octarthrus Fall

Microphotus octarthrus Fall, 1912, Canadian Ent., 44:45.

Microphotus abbreviatus E. Olivier, 1912, Ent. Soc. Belg., Ann., 56:26.

MALE. Form narrow, parallel-sided. Antennae with eight segments. Eyes beneath broadly contiguous posteriorly. Pronotum slightly wider than long, lateral margins converging posteriorly, rarely parallel, base truncate; median longitudinal line not impressed. Elytra pale brownish piceous with infuscate tips, short, about two and one-half times as long as pronotum; secondary pubescence distinct except near base, gradually longer and denser distally, very short in about basal half. Genitalia as in figure 2. Length 4.25-6.25 mm.

FEMALE. Similar to female of *M. angustus*. Antennae with six segments. Tarsi with five segments.

DISTRIBUTION. TEXAS: Alpine; Brewster County; Chisos Mts., Big Bend Park; Davis Mts.; Marathon; 65 mi. S. of Marathon; Presidio; 12 mi. S. of Presidio. April, May, June, July, September. NEW MEXICO: Ima; Jemez Mts.; Jemez Springs; Organ; Pecos. July. ARIZONA: Ft. Grant; Pinal Mts.; Prescott; Rincon Mts.; Santa Rita Mts.; Yarnell Hill. June, July. UTAH: Bellevue; Hurricane; St. George; Zion County. May, June, July. CHIHUAHUA: Canon Prieto, nr. Primavera; 25 mi. SW. of Camargo. July. COAHUILA: Sierra de Tlahualilo, 4,000 ft., Ojo de Agua, July.

This is our smallest species, easily recognized by its short elytra with infusate tips, together with the truncate base of the pronotum. Only *M. dilatatus* has similarly short elytra. It differs from *M. octarthrus* externally in having the base of the pronotum shallowly emarginate; and in its larger size, broader form, and darker coloration, the elytra being uniformly dark piceous brown. Fall's type is from the Rincon Mountains, Arizona; Olivier's from Fort Grant, Arizona.

***Microphotus angustus* LeConte**

Microphotus angustus LeConte, 1874, Amer. Ent. Soc., Trans., 5:58.

Microphotus robustus E. Olivier, 1911, Revue Sci. du Bourbonnais, 24:80
(new synonymy).

MALE. Antennae usually with nine segments, sometimes ten. Eyes beneath briefly contiguous, or nearly so, posteriorly. Pronotum one-third to one-fourth wider than long, lateral margins subparallel or slightly diverging posteriorly, base truncate; median longitudinal line not impressed. Elytra about three and one-third times as long as pronotum, secondary pubescence sparse and extremely minute in basal half or more, gradually longer and denser distally. Genitalia as in figure 3. Length 6.5-11 mm.

FEMALE. Larviform, without wings or elytra. Integuments granulate-punctate throughout, with sparse decumbent primary pubescence and dense extremely minute secondary. Color pale reddish testaceous, varying to somewhat darker except at sides. Head small, elongate, horizontal; eyes vestigial, with very few facets. Antennae similar to male, with six or seven segments. Mouth not deflexed; clypeus and labrum similar to male; mandibles stout, straight, terminal tooth horizontally compressed, elongate triangular, extending anteriorly in line with basal part of mandible and more than half as long, tip acute. Palpi similar in structure to male, the maxillary shorter and much stouter, segments all transverse.

Pronotum variable, usually more or less semi-elliptic. Mesonotum slightly shorter than pronotum, lateral margins regularly arcuate, hind angles broadly rounded. Metanotum similar to mesonotum, slightly wider. Abdomen with eight tergites, widest at tergite 3, thence tapering to apex; lateral margins of tergites feebly arcuate, hind angles narrowly rounded, pygidium with hind angles somewhat produced pos-

teriorly.

Prosternum before coxae about one-third as long as pronotum, narrowing anteriorly, apical margin truncate or emarginate, parapleurae not definitely separated from prosternum. Abdomen with eight ventral segments, the first extending well behind coxae and only slightly shorter than second, each segment with spiracles located near lateral margins. Light organs not apparent. Tarsi with five segments.

DISTRIBUTION. CALIFORNIA: Bear Lake; Berkeley; Blocksburg; Burbank; Claremont; Dulzura; Fort Seward; Humboldt County; Kaweah; Keddie; Los Angeles; Mokel Hill; Mt. Wilson; Oakland; Pine Hills; Pinon Flat, San Jacinto Mts.; San Diego; San Jose; Santa Barbara; Santa Clara County; Santa Cruz; Santa Cruz Mts.; Seneca; Sherwood; Shasta County; South Fork Feather River, Butte County; Sylvania; Tanbark Flat, San Gabriel Mts.; Tulare County; Tuolumne County; Trinity County; Waterman Canyon; Yosemite. March, May, June, July, November. OREGON. Klamath (CM)

Variation in the number of antennal segments has been noted only in this species and in *M. dilatatus*. Olivier undoubtedly described *M. robustus* from a large specimen of *M. angustus* with ten-segmented antennae. His description consists otherwise of generalities applying equally as well to most of the other species of the genus.

LeConte records *M. angustus* from Mariposa, Oregon, which is evidently an error for Mariposa, California. In his descriptions of other species following in the same paper, he cites specimens from Mariposa, California, several times. All his Mariposa material was collected by Dr. Thevenet. The Oregon record listed above is the only one seen from that state and may be dubious.

***Microphotus decarthrus* Fall**

Microphotus decarthrus Fall, 1912, Canadian Ent., 44:45.

MALE. Antennae with ten segments. Eyes beneath briefly contiguous, or nearly so, posteriorly. Pronotum nearly as long as wide, lateral margins somewhat converging posteriorly, varying to subparallel, base truncate; median longitudinal line strongly impressed anteriorly; circular convex area over eyes usually extending not more than half way from apex to base, with coarse irregularly confluent punctures medially, becoming finer and sparser laterally, sometimes leaving a smooth transparent spot each side over eyes. Scutellum broadly rounded or subtruncate at apex, varying to slightly notched. Elytra about three and one-fourth times as long as pronotum; tips sometimes lightly infusate; secondary pubescence distinct except near base, gradually longer and denser distally, very minute in basal half or more. Apical process of ventral segment 8 sublinear except at base. Genitalia as in figure 4. Length 6-8 mm.

DISTRIBUTION. ARIZONA: Chiricahua Mts., Fall type (MCZ); Pinal Mts., Ingham, 3 males (Parker); S. Catalina Mts., Summerhaven, 8000 ft., O. Bryant, 1 male (CAS).

The identity of this species was determined by an examination of Fall's type and only specimen. It closely resembles *M. angustus*, in which the antennae are sometimes 10-segmented. The strongly impressed median longitudinal line of the pronotum readily distinguishes *M. decarthrus*, as does also its more eastern habitat.

In the following species, *M. fragilis* E. Olivier, the median longitudinal line of the pronotum is also strongly impressed and the genitalia are similar to *M. decarthrus*, but in the former the eyes are larger and very broadly contiguous beneath posteriorly. Other distinguishing characters, more or less variable, of *M. fragilis* are: the larger size and broader form; the circular convex area of the pronotum extending distinctly more than half way from apex to base; the narrowly rounded apex of the scutellum; and the broader subtriangular process of ventral segment 8.

***Microphotus fragilis* E. Olivier**

Microphotus fragilis E. Olivier, 1912, Soc. Ent. Belgique, Ann., 56:26.

MALE. Antennae with ten segments. Eyes beneath broadly contiguous posteriorly. Pronotum about one-tenth wider than long, widest near middle, lateral margins more or less converging posteriorly, base truncate; median longitudinal line strongly impressed, sometimes nearly reaching apex; circular convex area over eyes extending more than half way from apex to base, shining, unusually smooth, impunctate and transparent each side, punctures elsewhere smaller and sparser than usual, denser medially. Scutellum narrowly rounded at apex. Elytra about three and one-fourth times as long as pronotum, tips sometimes slightly infuscate; secondary pubescence distinct except near base, gradually longer and denser distally, very minute in basal half or more. Ventral segment 8 with apical process elongate triangular. Genitalia similar to figure 4. Length 8.5-9 mm.

DISTRIBUTION. ARIZONA: Santa Rita Mts., 12/5, Hubbard & Schwarz, Olivier cotype (USNM); no definite locality; 2 males (ANSP), 1 male (INHS).

Fall (1928) considered this species to be a synonym of his *M. decarthrus*. The present identification is based on a specimen in the National Museum collection bearing labels as follows: "Santa Rita Mts., Ar., 21/5," "Coll. Hubbard & Schwarz," "Cotype No. 19297," and "M. fragilis Oliv." the last one not in Olivier's handwriting. A second cotype No. 19297 from "Chiric. Mts., Ar., Hubbard & Schwarz" (USNM) is a specimen of *M. chiricahuac* Green, an unaccountable error considering its 8-segmented antennae. It is possible that Olivier's type may prove to be an example of *M. decarthrus*, in which case the present species would be without a name.

Both *M. decarthrus* and *M. fragilis* are exceedingly rare, only five examples of the former and four of the latter having been available for study. At present it seems that two species are involved, but more

abundant material may not uphold this conclusion.

Microphotus pecosensis Fall

Microphotus octarthrus pecosensis Fall, 1912, Canadian Ent., 44:45.

MALE. Antennae with eight segments. Eyes beneath briefly contiguous, or nearly so, posteriorly. Pronotum slightly wider than long, lateral margins subparallel, varying to divergent or convergent posteriorly, base truncate; median longitudinal line not impressed. Scutellum usually rounded at apex. Elytra about three and one-half times as long as pronotum, tips more or less infusate; secondary pubescence distinct except at base, gradually longer and denser distally. Genitalia as in figure 5. Length 6-8 mm.

FEMALE. Similar to female of *M. angustus*. Antennae with six segments. Tarsi with four segments. In some Colorado examples (Rotger), probably of this species, the tarsi are 3-segmented.

DISTRIBUTION. TEXAS: Valentine, Presidio County, IV-30-27, J. O. Martin, 1 male (CAS), with atypical genitalia. NEW MEXICO: Jemez Mts.; Pecos, Fall types. June, July. COLORADO: Royal Gorge, July. Junction Creek; San Luis Valley; Stollsheimer; all females, June and July, identity not certain (Rotger). UTAH: Cedar City, Iron County; Eureka; Navajo Lake; Zion Canyon, Wylie Camp; Zion County. June. ARIZONA: Flagstaff; Globe; Oak Creek Canyon, 16 mi. S. of Flagstaff; Navajo Nat. Mon., Betatkin Canyon; Pinal Mts.; Prescott Nat. Forest, Indian Creek Camp; Santa Rita Mts.; Williams. June, September. CALIFORNIA: San Diego, H. Klages coll'n., 1 male (CM), a most unlikely record and probably erroneous. CHIHUAHUA: San Jose Babi-cora. July.

Fall described *M. pecosensis* as a variety of *M. octarthrus*, stating that he did not accord it specific rank because one specimen in his series of four had short elytra, as in *M. octarthrus*. The odd specimen was actually an *M. octarthrus*, whose wide distribution was unknown to Fall. Attention is called to Fall's table of measurements on page 47 (1912), and his inadvertent transposition of the names *octarthrus* and *pecosensis* in the first column.

The present species seems to be our most variable one, and may be in the process of splitting into several different forms of which only the next species is well defined. One example, from Valentine, Texas, has the apices of the lateral lobes of the aedeagus very broad and slightly notched, as viewed from the side. This could indicate a valid species or it may be only a deformity, although both lateral lobes are of the same structure. The scutellum is rounded at apex in all except a specimen from Chihuahua, where it is broader and slightly notched.

Microphotus chiricahuae Green, new species

HOLOTYPE. MALE. Chiricahua Mts., Arizona, 8-9000 ft., VII-3-1927, Rustler Park, Cochise County, J. A. Kusche. In collection of California Academy of Sciences.

Form similar to *M. pecosensis*. Antennae with eight segments. Eyes beneath briefly contiguous, or nearly so, posteriorly. Pronotum as long as wide, widest near middle, lateral margins slightly converging posteriorly, base truncate; median longitudinal line not impressed; convex area over eyes punctate throughout, punctures irregularly confluent medially, finer and sparser laterally, without transparent spots. Scutellum with small apical notch. Elytra about three and one-half times as long as pronotum, tips not infusate; secondary pubescence distinct except near base, gradually longer and denser distally, very short in about basal half. Genitalia as in figure 6. Length 7 mm.

VARIATIONS. The lateral margins of the pronotum may be parallel, the scutellar notch varies from quite deep to nearly obsolete, and the tips of the elytra are sometimes definitely infusate. Length 6-7 mm.

DISTRIBUTION. All records following are from the Chiricahua Mts., Cochise County, ARIZONA: Rustler Park, 8-9000 ft., VII-3-27, J. A. Kusche, holotype and 3 paratypes (CAS); Cave Creek, 7000 ft., VI-24-27, J. A. Kusche, 5 paratypes (CAS); Cave Creek, 8000 ft., VI-29-27, J. A. Kusche, 1 paratype (CAS); Cave Creek, VI-20-29, J. O. Martin, 3 paratypes (CAS); Flys Peak, 9500 ft., VII-9-27, J. A. Kusche, 1 paratype (CAS); SW. Research Station, 5 mi. W. of Portal, VI-15-58, C. D. McNeill, 2 paratypes (CAS); SW. Research Sta., VI-17-55, M. Statham, 1 paratype (AMNH); no precise locality, all collected by Hubbard and Schwarz, 2 paratypes of which one is a cotype of *M. fragilis* Olivier, and 2 females (USNM).

This species is closely related to *M. pecosensis*, from which it differs greatly in the much broader median lobe of the aedeagus and the non-sinuate ventral inner margins of the lateral lobes. Externally it is not distinguishable with certainty from *M. pecosensis*. Differences of some value between the two species are the usually notched scutellum, and the shorter secondary pubescence in the basal half of the elytra of *M. chiricahuae*. Probably the locality labels will serve to identify this species, which seems to be confined to the Chiricahua Mountains of southern Arizona. No examples of *M. pecosensis* have been seen from that region. The two females listed above have the antennae and tarsi with six and four segments respectively.

EMENDATION OF THE TRIBE LAMPYRINI

The standard definition of the tribe *Lampyrini* has heretofore been the largely inaccurate statement that the terminal segment of the antennae is appendiculate. A too literal acceptance of this tradition led the author into an error in erecting a new genus for two American representatives of *Lampyris*, previously unknown from the Western Hemisphere. In the following discussions, all statements apply to males only unless otherwise indicated.

In the subfamily Lampyrinae (Green, 1948), two types of mandibular structure occur, which for convenient reference may be called normal, and modified. In the normal type the mandibles are arcuate and regularly narrowing to the tips, which are not differentiated in any way from the basal part. In the modified type the mandibles are more or less porrect, coarsely pubescent externally, and with quite slender glabrous tips variably discontinuous in curvature with the stout basal part. It is proposed to redefine the tribe *Lampyrini* to include only those genera in which the mandibles are modified, very small, and largely concealed from above by the elongate clypeus, which extends nearly or quite to their tips.

American Lampyrinae—partial table of tribes

- | | |
|--|----------------------------|
| 1. Mandibles modified (see preceding paragraph) | 2 |
| Mandibles normal, prominently exposed above. Abdominal spiracles dorsal
.....Tribe Photinini (and others?) | |
| 2. Clypeus elongate, extending nearly or quite to tips of mandibles and largely concealing them from above. Mandibles small, glabrous tips often reduced to minute denticles. Abdominal spiracles variable | Tribe Lampyrini |
| Clypeus basal, mandibles prominently exposed above | 3 |
| 3. Tarsi slender, terminal segment extending for at least half its length beyond lobes of fourth. Sexes dissimilar, females flightless. Abdominal spiracles ventral | Tribe Pleotomini |
| Tarsi stout and compact, terminal segment extending only slightly beyond lobes of fourth. Sexes similar, alate | 4 |
| 4. Abdominal spiracles ventral | Tribe Limprocerini |
| Abdominal spiracles dorsal | Tribe Cratomorphini |

It may be noted that the last three tribes of the above table were formerly considered by the author to be subtribes of the *Photinini*. They must now be advanced to tribal rank because of the increased importance assigned to the mandibular structure.

TRIBE LAMPYRINI

The composition of the *Lampyrini* is not greatly altered by the proposed emendation. In the American fauna, *Phausis* and *Phosphoenus* are excluded because of their normal mandibles, while *Alecton* and

Petalacmis are added. No representatives of the South American *Lucernuta*, *Calotrachelum*, and *Oliviereus* have been available for study. The oriental species assigned to *Pyrocoelia* by Gorham belong to this tribe. Olivier considered *Pyrocoelia* to be a synonym of *Lucernuta*, but this is in need of re-examination.

The antennal appendix is plainly evident in *Microphotus* as a non-setigerous tuberculiform addition to the terminal segment, from which it differs in texture. It is not to be confused with the setigerous granules of varying sizes that beset the apex of the terminal segment in other Lampyrini. A true appendix is also present in the American species of *Phausis*, but not in the Palearctic *P. splendidula*. The appendix has also been noted in the larviform female of *Cladodes ater* Solier, indicating its lack of any major taxonomic significance.

North American Lampyrini—key to genera

- | | |
|---|------------------------------|
| 1. Eyes large, contiguous beneath or nearly so | 2 |
| Eyes smaller, distant beneath. Abdominal spiracles dorsal | 3 |
| 2. Antennae with eleven segments, terminal segment (of American species) not
appendiculate. Ventral segment 8 without apical process. Abdominal spiracles
ventral | Lampyris Linne |
| Antennae with less than eleven segments, terminal segment with distinct tuber-
culiform appndix. Ventral segment 8 with apical process. Abdominal spiracles
situated just exterior to lateral margins of segments, sometimes visible ventro-
laterally | Microphotus LaConte |
| 3. Antennae normal, with eleven segments. Ventral segment 8 with apical process
..... | Paraphausis Green |
| Antennae modified. Ventral segment 8 without apical process | 4 |
| 4. Antennae with 11 or 12 segments, eccentrically perfoliate, segments 3 to 10 each
somewhat produced internally (Cuba) | Alecton Laporte |
| Antennae with nine segments, terminal segment greatly enlarged and much longer
than 1 to 8 combined. (So. Amer.) | Petalacmis E. Olivier |

LAMPYRIS is represented by two rare Florida species originally described under the generic name of *Pleotomodes*, which for the present should be regarded as a synonym of *Lampyris*. As it now stands, *Lampyris* is a composite mixture of various generic types, not all of which lack the antennal appendix, nor do they all have 11-segmented antennae. A recapitulation of the distinguishing characters of the two American species, which were announced in separate papers, is given below. No genitalic differences have been noted.

Lampyris—key to American species

- | | |
|--|--------------------------|
| Eyes narrowly separated beneath. Form more elongate, parallel-sided. Primary
elytral pubescence inclined, less dense. Pygidium usually with apex subtruncate
and bisinuate | L. needhami Green |
|--|--------------------------|

Eyes contiguous beneath. Form shorter and broader, somewhat narrowing posteriorly. Primary elytral pubescence decumbent. Pygidium usually rounded at apex

.....L. *knalli* Green

PARAPHAUSIS. The apical spine of the mandibles was not noted in the original description, and was no doubt missing in the holotype. It is a fragile structure easily damaged by the manipulations the of the investigator, and probably also by its normal usage during the life of the insect. The only known species, *P. eximia* Green (1949) occurs in Arizona. The genitalia are so similar to those of *Microphotus* that they could well belong to a species of that genus.

ALECTON has been recorded only from Cuba. The three species recognized by Lang and Mutchler may be readily identified by the following compiled color key.

Alecton—key to species

1. Entirely pale yellow **A. flavum** Leng and Mutchler
Elytra partly black 2
2. Pale lateral border of elytra extending anteriorly to basal third. Antennae with three apical segments dusky **A. discoidalis** Castelnau
Pale lateral border of elytra extending anteriorly nearly to base. Antennae with six apical segments dusky **A. improvisus** E. Olivier

PETALACMIS. The only species, *P. praeclarus*, is listed from Brazil and Bolivia, and has recently been taken in Peru.

TRIBE PLEOTOMINI

In this tribe the mandibles are comparatively large and prominent, and fully visible from above, the glabrous tips being well developed and only feebly discontinuous in curvature with the pubescent basal part. The membranous labrum is very conspicuous between the mandibles. Four genera are known from the American fauna, one of them at present probably undescribed.

American Pleotomini—key to genera

1. Clypeus small and poorly defined, not extending forward beyond base of mandibles, its anterior margin arcuately emarginate. Abdominal spiracles prominent. Antennae biflabellate 2
Clypeus well defined, extending forward somewhat beyond base of mandibles, its anterior margin subtruncate or rounded. Abdominal spiracles small and inconspicuous. Antennae uniflabellate (Peru) UNDESCRIBED (?) GENUS
2. Antennae with 13 or 14 segments, the branches short and stout **Pleotomus** LeConte
Antennae with 11 segments, the branches long and slender 3
3. Legs long and slender, femora extending beyond sides of body. Elytra dehiscent **Calyptocephalus** Gray
Legs short, femora extending only to sides of body. Elytra not dehiscent **Phoenolis** Gorham

The undescribed genus indicated above is represented in the California Academy of Sciences collection by two Peruvian species keying to *Vesta* in Olivier's classification (1907). The ventral abdominal spiracles are small and inconspicuous, and would easily have escaped notice were it not for the modified mandibles indicating their probable presence. Antennal segments 3 to 10 each have the inner apical angle extended in a process as long as the segment. The two species are quite similar in appearance: black, the pronotum fulvous with, or without, narrow black borders.

The species of *Pleotomus* are probably more numerous than is indicated in the list, but at present only two species, or species groups, can be defined. LeConte described *P. davisii* from a single female collected in Kentucky. It is generally assumed that males from the Eastern States, having the elytra dark with pale borders, are conspecific with LeConte's female. A pale form occurring in Texas, *P. pallens* LeConte, is variable in color, some examples having the elytra as dark as the eastern specimens. No structural characters have been found for separating the eastern and western specimens, and it is uncertain whether more than one species is involved. Examples from Sinaloa, Nayarit, Tamaulipas, and San Luis Potosi are at hand, also variable in color and not definitely separable from the Texas specimens. All have the head concave between the eyes. The rare *P. nigripennis* LeConte, from the Southwestern States, is without doubt a distinct species. The eyes are smaller and more widely separated beneath, the head not concave between them, and the elytra are entirely black. The color of the ventral surface and legs is variable.

TRIBE LAMPROCERINI

The heterogeneous assemblage placed by Olivier in his subfamily *Lamprocerinae* has been reduced to four homogeneous neotropical genera. The species are mostly South American, and only one, *Tenaspis angularis* Gorham, enters the Nearctic fauna. These appear to be the only Lampyrids with ventral abdominal spiracles in which the females are known to be alate and similar to the males. They are characterized by their above average size, broad scutate form, firmly sclerotized integuments, and stout compact tarsi with the terminal segment extending only slightly beyond the lobes of the fourth. In the scanty material available it is noted that the terminal segment of the labial palpi is broadly securiform.

Lamprocerini—key to genera

- | | |
|--|---|
| 1. Antennae biflabellate | 2 |
| Antennae uniflabellate or simple | 3 |

2. Outer ramus of antennal segments shorter than inner ramus **Lucio** Castelnau
 Outer and inner rami of equal length **Lamprocera** Castelnau
3. Ventral segment 9 of male exposed **Hyas** Castelnau
 Ventral segment 9 not exposed **Tenaspis** LeConte

TRIBE CRATOMORPHINI

Four genera are recognized in this tribe, but it seems certain that this number is too small to indicate correctly the relationships of the numerous species involved. All are confined to the Western Hemisphere.

Cratomorphini—key to genera

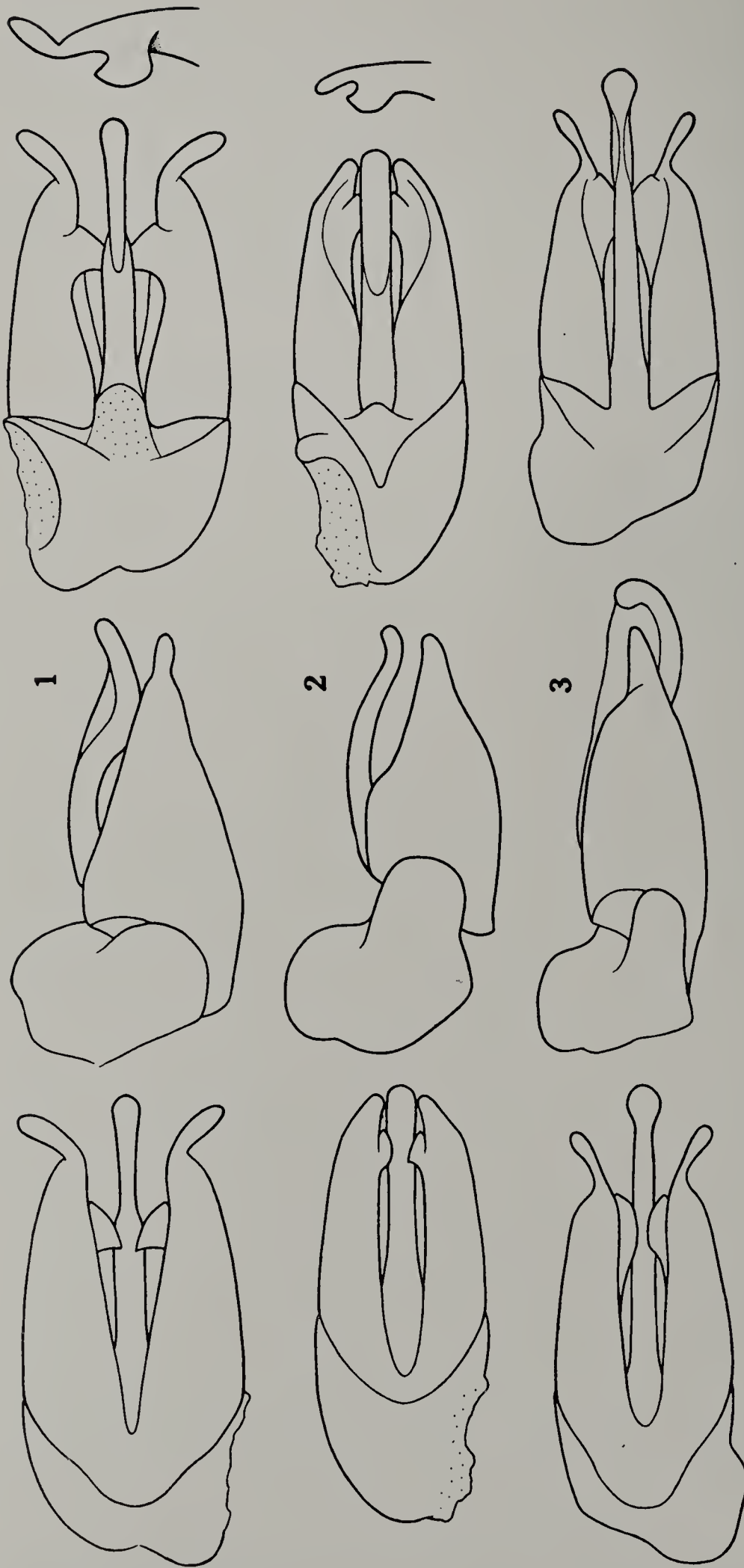
1. Pronotum with two anterior vitreous spots. Eyes very large, head concave between them. Abdomen foliate **Cratomorphus** Motschulsky
 Pronotum without vitreous spots. Eyes moderate, head not concave. Abdomen not foliate 2
2. Form broad, usually narrowing posteriorly. Epipleurae very wide **Aspisoma** Castelnau
 Form elongate, parallel-sided. Epipleurae narrow 3
3. Pronotum in part alutaceous and with a more or less distinct median longitudinal carina. Prosternum truncate in front. Clypeus connate with front
 **Pyractomena** LeConte
 Pronotum not alutaceous, without median carina. Prosternum distinctly emarginate medially. Clypeus not connate with front..... **Micronaspis** Green

TRIBE PHOTININI, and others

After removing the preceding four tribes, there remains in the *Lampyrinae* a vast aggregation of species for which many more genera will be required than the comparatively small number currently recognized. They present a problem in taxonomy for which no easy solution is apparent. Such genera as *Lucidota* (not the complex of Olivier), *Ellychnia*, *Pyropyga*, *Photinus*, *Pyractonema*, *Lucidina*, and perhaps *Aethra*, constitute a homogeneous group—the tribe *Photinini*. *Phausis* and *Phosphoenus*, excluded from the *Lampyrini* by their normal mandibles, do not fit well in the photinid series, nor with each other. *Cladodes*, *Dodacles*, *Ledocas*, *Dryptelytra*, *Psilocladus*, and *Vests* possibly should form another major division. Olivier limited *Vests* to those species having uniflabellate antennae. A number of neotropical species with simple antennae, such as *Lucidota discolor* Gorham, are more properly placed in *Vesta* because of having genitalia of the peculiar type found in that genus. In *Vesta* each lateral lobe of the aedeagus is provided with a slender and fragile appendage arising externally, a structure known to occur elsewhere in the *Lampyridae* only in *Photuris*.

LITERATURE CITED

- FALL, HENRY C. 1912. New Coleoptera chiefly from the Southwest, V. Canadian Entomologist, vol. 44, pp. 40-48.



Male genitalia; showing from left to right, dorsal, lateral and ventral aspects.
Male genitalia; showing from left to right, dorsal, lateral, and ventral aspects.

FIGURE 1. *Microphotus dilatatus* LeConte, 6 mi. N. of Triunfo, Lower California, VI-15-38, Michelbacher & Ross (CAS).
Tip of lateral lobe with subapical process.

FIGURE 2. *Microphotus octarthrus* Fall, Davis Mts. Texas, VI-28-46, Van Dyke coll'n. (CAS). Tip of lateral lobe with subapical process.

FIGURE 3. *Microphotus angustus* LeConte, San Diego, Calif., L. E. Ricksecker (CU).

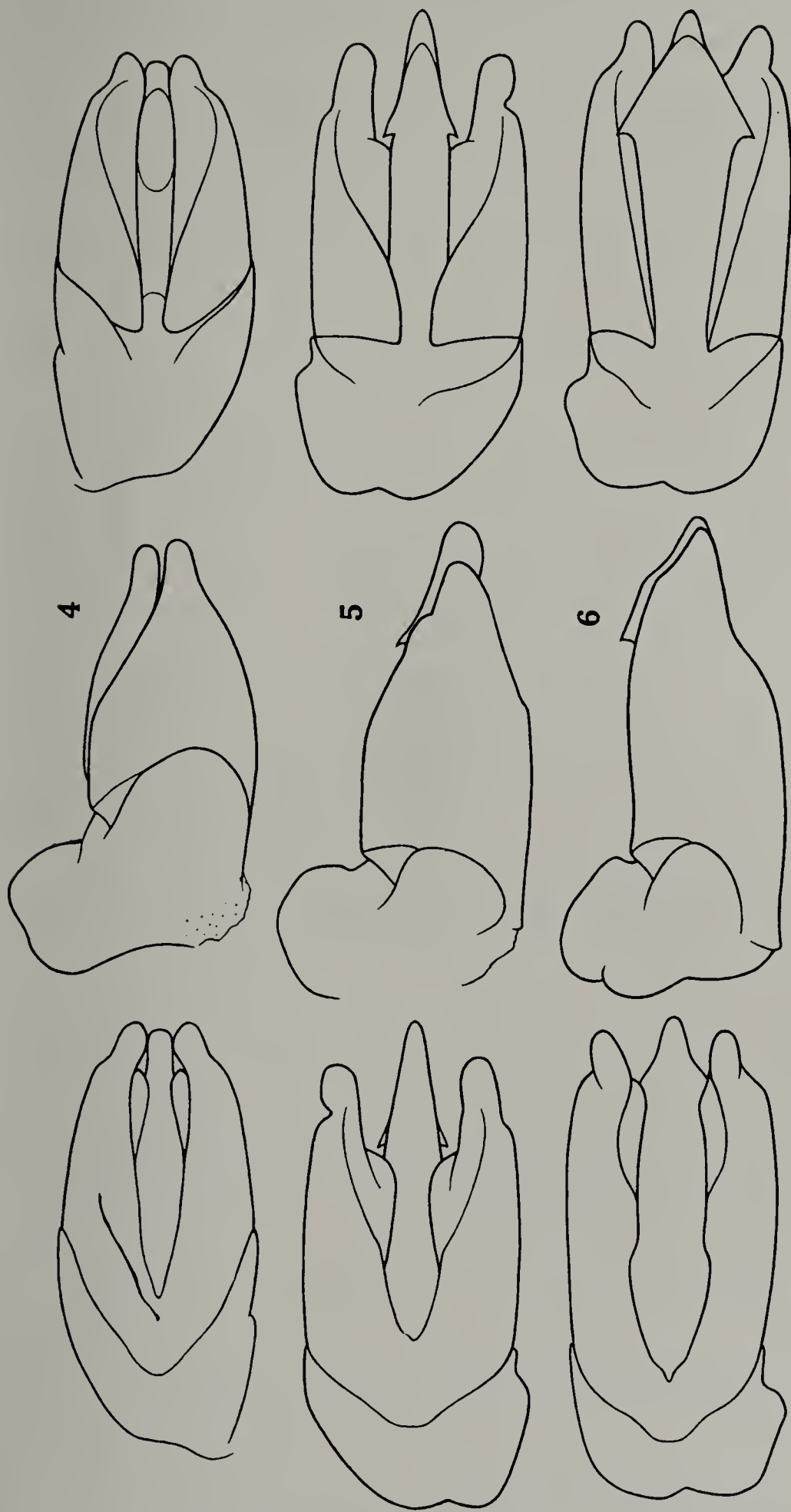


FIGURE 4. *Microphotus decarthrus* Fall, Santa Catalina Mts., Arizona, Summerhaven, 8000 ft., VI-15-33, Owen Bryant (CAS).

FIGURE 5. *Microphotus pecosensis* Fall, Eureka, Utah, VI-9, Tom Spalding, Van Dyke coll'n. (CAS).

FIGURE 6. *Microphotus chiricahuae* Green, new species, holotype, Chiricahua Mts., Arizona, Rustler Park, 8-9000 ft., VII-3-1927, J. A. Kusche (CAS).

- . 1928. Miscellaneous notes and descriptions (Coleoptera). Brooklyn Entomological Society, Bulletin, vol. 23, pp. 236-240.
- GREEN, JOHN WAGENER. 1948. Two new species of Lampyridae from Southern Florida, with a generic revision of the Nearctic fauna. American Entomological Society, Transactions, vol. 74, pp. 61-73.
- . 1949. A new genus and new species of American Lampyrini, and other notes. American Entomological Society, Transactions, vol. 75, pp. 1-6.
- LECONTE, JOHN L. 1866. New species of North American Coleoptera, Part 1. Smithsonian Miscellaneous Collections, 2nd ed., vol. 6, no. 167, pp. 1-177.
- . 1874. Descriptions of new Coleoptera chiefly from the Pacific Slope of North America. American Entomological Society, Transactions, vol. 5, pp. 43-72.
- LENG, CHARLES W. and MUTCHLER, ANDREW J. 1922. The Lycidae, Lampyridae, and Cantharidae of the West Indies. American Museum of Natural History, Bulletin, vol. 46, pp. 413-499.
- OLIVIER, ERNEST. 1907. Fam. Lampyridae. Genera Insectorum, 53me fascicule, pp. 1-74.
- . 1911. Revision des Lampyrides. Revue scientifique du Bourbonnais et du centre de la France, vol. 24, pp. 63-85.
- . 1912. Lampyrides faisant partie des collections du musee de Washington. Society Entomologique de Belgique, Annales, vol. 56, pp. 24-27.

NEW PUBLICATIONS

MEMOIRS OF THE AMERICAN ENTOMOLOGICAL SOCIETY, Number 16, A Taxonomic Study of the North American Licinini with Notes on the Old World Species of the Genus *Diplocheila* Brulle (Coleoptera) by GEORGE E. BALL, 258 pages of text, 75 tables, 3 diagrams, 15 plates, table of contents and index. This monograph considers the geographical variation, relationships, evolution and taxonomy of the carabid tribe Licinini. A general treatment, explaining the taxonomic approach used, definition of terms, criteria for delimiting species and subspecies, etc., precedes the systematic position. The genera *Diplocheila* (subgenera *Diplocheila*, *Neorembus*, *Isorembus*), *Dicaelus* (subgenera *Paradicaelus*, *Dicaelus*, *Liodycaelus* and *Badister* (subgenera *Badister*, *Trimorphus*, *Baudia*) are each treated in some detail. Keys to the genera and species are given throughout as well as a description (or diagnostic notes), variation, distribution and frequently locality records for each of the forms treated. The phylogeny and zoogeography of each genus is discussed in a separate section. Variation of mensurable characters is treated in the 75 tables. Fifteen plates depict structural (including genitalia) and variational features of the species discussed. Price \$10.00 postpaid. Available from: The American Entomological Society, 1900 Race Street, Philadelphia 3, Penna., U.S.A. EDITOR.

COLEOPTERORUM CATALOGUS, Supplementa, Pars 35, fasc. 2, 2nd ed., Chrysomelidae: Hispinae, by Erich Uhman. Junk, The Hague, 398 pp., 1958. 75 Guilders (= \$19.94.)

This is a continuation of the supplements to the Junk Catalogue. There are now 11 *pars* completed, or at least several facsimiles issued. Fifty *pars* are now in preparation. The original catalogue is still available, with the exception of three *pars* (157, 169, and 170) which we assume will eventually be reissued. The price for the complete catalogue is 2,000 Guilders, or \$531.60. EDITOR.